

**CLAIMS**

What is claimed is:

1. An enzyme solution comprising an anti-freeze protein and an enzyme; wherein said enzyme retains enzymatic activity after at least one freeze/thaw event.
2. The enzyme solution according to Claim 1, wherein said enzyme retains activity after more than ten freeze/thaw events.
3. The enzyme solution according to Claim 1 or 2, further comprising a buffer.
4. The enzyme solution according to Claim 3, wherein said buffer is zwitterionic.
5. The enzyme solution according to any one of Claims 1 to 4, further comprising a carrier protein.
6. The enzyme solution according to Claim 5, wherein said carrier protein is bovine serum albumin (BSA).
7. The enzyme solution according to any one of Claims 1 to 6, wherein said anti-freeze protein comprises an alanine-rich motif.
8. The enzyme solution according to any one of Claims 1 to 7, wherein said anti-freeze protein is an AFP Type I protein.
9. The enzyme solution according to any one of Claims 1 to 9, wherein the pH of the composition is from about 7.9 to about 8.9.
10. The enzyme solution according to any one of Claims 1 to 9, further comprising a polyol.
11. The enzyme solution according to Claim 10, wherein the polyol is sorbitol, trehalose or mixtures thereof.
12. The enzyme solution according to any one of Claims 1 to 11, wherein the anti-freeze protein has a concentration of from about 10  $\mu\text{g/ml}$  to about 200  $\mu\text{g/ml}$ .
13. The enzyme solution according to any one of Claims 1 to 12, wherein said enzyme is a DNA polymerase and the addition of said enzyme solution to an amplification reaction mixture improves the sensitivity and yield of the nucleic acid amplification reaction.
14. A reaction mixture for use in a nucleic acid amplification reaction, comprising dNTPs and an enzyme solution according to Claim 13.
15. A method for enhancing the stability of an enzyme over the course of two or more freeze/thaw events, comprising the addition of an anti-freeze protein to an enzyme solution containing said enzyme prior to said freeze thaw events.

16. A method for increasing the sensitivity and yield of a nucleic acid amplification reaction, comprising combining a target nucleic acid sequence with at least one primer in a reaction mixture according to Claim 14 and amplifying said target nucleic acid sequence, wherein the inclusion of said anti-freeze protein increases amplicon yield and sensitivity.

17. An improved method for detecting a target nucleic acid sequence in a sample, comprising combining said sample with at least one primer in a reaction mixture according to Claim 14 and amplifying said target nucleic acid sequence; wherein the inclusion of said anti-freeze protein increases signal intensity and improves the signal-to-noise ratio.

18. An improved method for quantifying a target nucleic acid sequence in a sample, comprising combining said sample with at least one primer in a reaction mixture according to Claim 14 and amplifying said target nucleic acid sequence; wherein the inclusion of said anti-freeze protein increases signal intensity and improves the signal-to-noise ratio.

19. A kit comprising:  
a solution comprising an anti-freeze protein and an enzyme.

20. The kit of claim 19 wherein the solution further comprises a carrier protein.